

AMENDMENTS TO THE CLAIMS

1. (Currently amended) A gene detection system for detecting a target gene upon hybridization with a probe, said gene detection system comprising:

a probe-immobilizing support comprising an electrode on which a the probe is immobilized and an electrode substrate for supporting the electrode; and

heating and cooling means disposed in contact with ~~another~~ a location different from ~~the~~ a surface of the probe-immobilizing support ~~on which the probe is immobilized; and~~

a heat insulating member covering a circumferential surface of the electrode.
2. (Currently amended) ~~A~~ The gene detection system according to Claim 1, wherein the heating and cooling means comprises a soaking component disposed in contact with ~~the~~ a surface opposite to the surface of the probe-immobilizing support ~~on which the probe is immobilized~~, and a heating and cooling element disposed in contact with the soaking component.
3. (Currently amended) ~~A~~ The gene detection system according to Claim 2, wherein the thermal capacity of the soaking component is greater than ~~the thermal capacity that~~ of the probe-immobilizing support.
4. (Currently amended) ~~A~~ The gene detection system according to Claim 2 or 3, wherein the soaking component comprises a temperature sensor for measuring ~~its~~ a temperature of the soaking component, and

~~controls the~~ an actuation of the heating and cooling element ~~based on~~ is controlled according to the temperature measured by the temperature sensor.
5. (Currently amended) ~~A~~ The gene detection system according to Claim 2, wherein the heating and cooling element ~~consists of~~ comprises a Peltier element or a heater.
6. (Cancelled)

7. (Cancelled)

8. (Cancelled)

9. (Currently amended) A The gene detection system according to Claim 7 1, wherein the electrode is equipped, at least on the surface thereof, with a portion comprising gold, silver, or copper, and the electrode substrate comprises a ceramic material.

10. (Currently amended) A The gene detection system according to Claim 7 1, wherein the electrode comprises a plurality of electrodes.

11. (Currently amended) A The gene detection system according to Claim 7 10, wherein ~~the electrode comprises a plurality of electrodes so that~~ a plurality of ~~types of~~ probes ~~may be~~ is immobilized ~~on each electrode,~~

~~the electrode substrate comprises a plurality of electrode substrates supporting the plurality of electrodes, respectively, and~~

~~the heating and cooling means independently controls the temperature of each of the plurality of electrode substrates~~ the plurality of electrodes wherein each probe detects a predetermined base sequence different from another probe.

12. (Currently amended) A gene detection device, comprising: a the gene detection system according to any one of Claims 1-5 and 9-11, and control means for controlling ~~the~~ actuation of the heating and cooling means.

13. (Withdrawn) A method for detecting genes using a gene detection system according to Claim 7, wherein the heating and cooling means is actuated to adjust the probe-immobilizing support to a desired temperature, and the double strand formed upon the hybridization of the target gene with the probe is electrochemically detected.

14. (Withdrawn) A method for detecting genes using a gene detection system according to Claim 7, said method for detecting genes comprising:

the step of allowing a target gene to hybridize with the probe to form a double strand;
and

the step of measuring the electrode reaction response as the heating and cooling means is actuated to vary the temperature of the probe-immobilizing support, and detecting the double strand on the basis of the relationship between the temperature and the electrode reaction response.

15. (Withdrawn) A method for detecting genes according to Claim 14, wherein the electrode reaction response is continuously measured as the temperature of the probe-immobilizing support is varied.

16. (Withdrawn) A method for detecting genes according to Claim 14, wherein DNA that is a full match with the base sequence of the probe and DNA that is a partial mismatch with the base sequence of the probe are allowed to hybridize with the probe, and

the proportion in which the full match DNA and partially mismatched DNA are present is determined by continuously measuring the electrode reaction response as the temperature of the probe-immobilizing support is varied.

17. (Withdrawn) A method for detecting genes according to Claim 14, wherein the electrode reaction response is measured as the heating and cooling means is actuated to continuously vary the temperature of the probe-immobilizing support.

18. (Withdrawn) A method for detecting genes according to Claim 14, wherein the electrode reaction response is measured as the heating and cooling means is actuated to vary the temperature of the probe-immobilizing support in steps.

19. (Withdrawn) A chip for detecting genes, comprising an electrode on which a probe is immobilized, an electrode substrate for supporting the electrode, and a soaking component

disposed in contact with the surface opposite the surface of the electrode substrate supporting the electrode,

the soaking component comprising a temperature sensor for measuring its temperature.

20. (New) A gene detection system according to Claim 1, wherein the heat insulating member comprises a resin.

21. (New) The gene detection system according to Claim 1, wherein the electrode is a pin.

22. (New) The gene detection system according to Claim 10, wherein the heating and cooling means independently controls a temperature of each of the plurality of electrode.

REMARKS

Prior to this Amendment, Claims 1-19 are pending in the application, with Claims 13-19 having been withdrawn from consideration. In the June 20, 2003 Office Action, the Examiner rejected Claims 1-12. By this Amendment, the applicants have cancelled Claims 6-8; amended Claims 1-5 and 9-12; and added Claims 20-22.

The Examiner has rejected Claims 1-12 under 35 U.S.C. 112 ¶2 as being indefinite. By this Amendment applicants have amended Claims 1-5 and 9-12 (Claims 6-8 having been cancelled, and Claims 13-19 having been withdrawn) as suggested by the Examiner to overcome the rejection under 35 U.S.C. 112 ¶2 and otherwise for clarification.

The Examiner has also rejected Claims 1-2, 5-7, 10 and 12 under 35 U.S.C. 102(b) as being anticipated by Lipshutz (U.S. Patent No. 5,856,174). Applicants have amended Claim 1 to incorporate the limitations of Claim 8. The Examiner did not find Claim 8 as originally submitted (which indirectly depended from Claim 1) to be anticipated by Lipshutz. Accordingly, Claim 1 as amended, and amended Claims 2, 7, 10 and 12, which depend from Claim 1, are allowable over Lipshutz.

The Examiner rejected Claims 1-7 and 10-12 under 36 U.S.C. 102(b) as being anticipated by Yasuda et al (U.S. Patent No. 6,093,370). Applicants have amended Claim 1 to incorporate the limitations of Claim 8. The Examiner did not find Claim 8 as originally submitted (which indirectly depended from Claim 1) to be anticipated by Yasuda. Accordingly, Claim 1 as amended, and amended Claims 2-5, 10 and 12, which depend from Claim 1, are allowable over Yasuda.

The Examiner has rejected Claims 8 and 9 under 35 U.S.C. 103(a) as being unpatentable over Yasuda in view of Heller et al (U.S. Patent No. 5,605,662). In this Amendment, Claim 8 has been cancelled, with the limitations of Claim 8 as originally submitted

now incorporated into amended Claim 1. Claim 9, as amended, depends from Claim 1 as amended. For the following reasons, Applicants respectfully submit that, as amended, independent Claim 1 and the claims depending from Claim 1 are allowable over Yasuda in view of Heller.

In the June 20, 2003 Office Action, the Examiner stated that Yasuda discloses, among other things, an “electrode-containing substrate (Column 11, lines 50-58, Fig. 11, #226) wherein the surface of the electrode is covered with a heat insulating member (Fig. 11).” Applicants respectfully submit that Yasuda does not disclose or suggest, alone or in combination with Heller, all of the limitations of amended Claim 1 of the present application. Specifically, Yasuda states explicitly that substrate 132 (Fig. 11) is “thermally conductive.” Column 11, lines 59-60. In addition, temperature control unit 133 (Fig. 11) must also be thermally conductive in order to conduct heat from heating elements 225 both to electrically insulating layer 222 and probe hybridization layer 221 (e.g., column 11, lines 4-14). Accordingly, Yasuda does not disclose or suggest “a heat insulating member covering a circumferential surface of the electrode,” as required by amended Claim 1.

The Examiner’s citation to Heller does not disclose or suggest the heat insulating member of amended Claim 1 of the present application. There is no suggestion in Yasuda or Heller to combine these references, and the Examiner does not cite to any suggestion to combine them. Moreover, there is also no disclosure or suggestion in Heller of “a heat insulating member covering a circumferential surface of the electrode,” as required by amended claim 1 of the present application. Accordingly, Applicants respectfully submit that amended Claim 1 is allowable over the Examiner’s rejection and that Claims 2-5, 9-12 and 20-22, which directly or indirectly depend from Claim 1, are also allowable.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

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Respectfully submitted,

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